

FENGER (C.)

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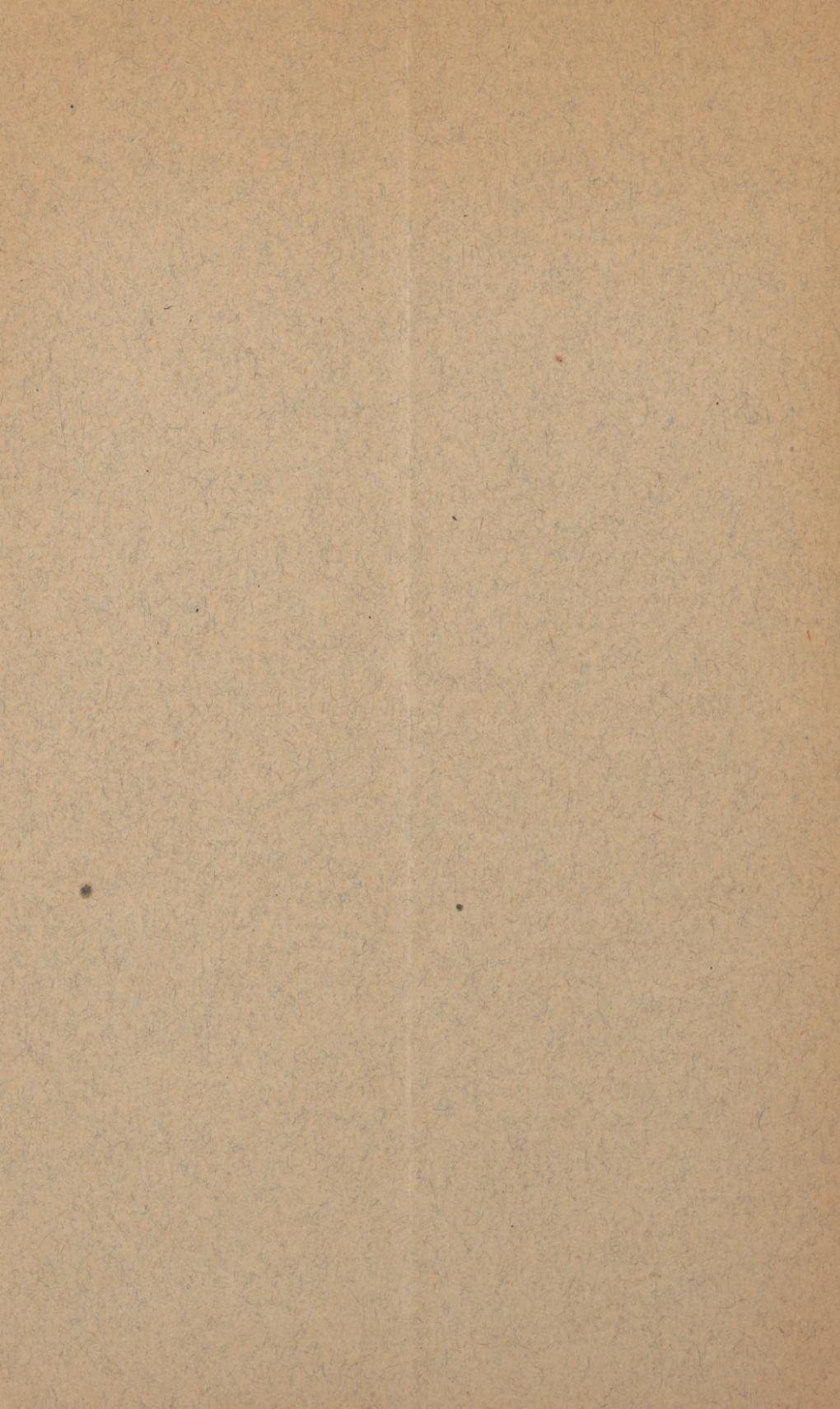
CHRISTIAN FENGER, M. D., CHICAGO.

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DEMONSTRATION OF SPECIMENS FROM OPERA- TIONS ON THE KIDNEY, WITH PRESEN- TATION OF PATIENTS.

By DR. CHRISTIAN FENGER, Chicago.

I desire to-night to demonstrate some specimens, gathered in the course of years from surgery of the kidney, and to present before the Society certain patients upon whom I have operated. I shall not attempt any systematic treatment of the subject of surgery of the kidney, but have grouped together specimens taken from patients upon whom I have operated. A short synopsis only of the histories, sufficient to illustrate the specimens, will be given here, as a detailed report of the cases will be published in connection with special papers on the different subjects at a future time.

We will consider first: carcinoma of the kidney; second, stones of the kidney, and third, stones in, and stenosis of the ureter.

1. CARCINOMA OF THE KIDNEY.

CASE I. With presentation of specimen. J. P. B., miner, aged forty. Six years previous to the operation he suffered from vague pains in the back and attacks of general malaise. Four years later he jumped from a rock to the ground, a distance of about ten feet. This was followed by copious hematuria which continued for eight days; intermittent attacks of hematuria of greater or less severity occurred from this

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time until three months before the operation, when the hematuria became continuous. The patient had also had pain in the left lumbar region, ever since the first attack of hematuria.

Physical examination negative ; no tumor, no increased dullness on percussion. The patient was anemic and weak. Amount of urine in twenty-four hours, from sixteen to twenty-four ounces. On one occasion a shred of tissue was found, which on microscopical examination was found to contain medium-sized oval and spindle-shaped cells with oval nuclei.

Diagnosis: Incipient sarcoma.

Operation: On April 24, 1888, lumbar nephrectomy was performed. The patient rallied well from the operation, but in twenty-four hours symptoms of uremia appeared, he became comatose and cyanotic with normal temperature and rapid pulse, and died on the third day after the operation. At the autopsy the right kidney was found to be normal in shape and size ; microscopical examination showed a slight cloudy swelling. The left kidney, which is here presented, shows a tumor the size of an orange, with part of the capsule adherent to it, situated in the middle of the kidney, leaving the upper and lower extremities free. There is a conical projection of the tumor down in the pelvis which resembles a mountain, and on the top of this mountain is a little ulcer. This is the place of the hemorrhage. It is strange however that the hemorrhage should have existed for more than two years and the ulcer still remain so small.

CASE II. With presentation of patient and specimen. V. L., tailor, twenty-seven years old. Previous health good with the exception of polyarticular rheumatism at age of eighteen. His father had undergone an operation for carcinoma of the lip, which resulted in cure.

In June, 1890, he suffered from hematuria which persisted for two weeks and was followed by intermittent attacks of weakness. The hematuria was accompanied by pain in the left hypochondrium, in the region of the infundibulum, or pelvic end of the ureter.

Physical Examination: The patient was anemic. Neither a tumor nor the lower end of the kidney could be felt. The urine was acid and contained a moderate quantity of blood. A diagnosis was made of nephrolithiasis or tumor, and exploratory incision recommended.

Operation: November 27th, 1890. An exploratory lumbar incision was made, which revealed a tumor the size of an

egg, in the middle of the kidney. After ascertaining by an exploratory incision over the right kidney that it was of normal size and appearance, left lumbar nephrectomy was performed. The patient made a good recovery. He remained eleven weeks in the hospital. The fistula closed after six months. A small temporary abscess formed a year later. In the first year after the operation the patient gained fifteen pounds in weight, and he is now in perfect health.

The tumor, which I here present, is round, two inches in diameter, situated on the anterior surface of the middle of the left kidney. It has a conical prolongation three-quarters of an inch in height projecting into the pelvis. On the apex of this cone there is a small ulcer or abrasion which was the source of the hematuria. Upon microscopic examination the tumor was found to be a tubular carcinoma with cubic and cylindrical cells. No capsule surrounded the tumor, but the kidney tissue was partly infiltrated and partly pushed aside, which would signify a reasonable degree of limitation.

REMARKS. 1.—Early diagnosis is impossible when the tumor is situated in the upper portion or even in the middle of the kidney, and when the lower third of the kidney is not changed in size or shape. When a tumor is so large that it can be felt by bimanual palpation, the disease is as a rule, of relatively long standing. In my experience it is exceptional to be able to palpate the lower third of a kidney of normal size and in normal location.

2. Hematuria is a symptom of the utmost importance when it occurs early, but it is absent in one-fourth of the carcinomata and one-half of the sarcomata in adults, and in three-fourths of both carcinomata and sarcomata in children. It is an early symptom if the tumor at an early stage of the disease, extends into the pelvis, and necrosis of the covering mucosa takes place. The importance of early hematuria lies in the possibility of extirpating the kidney before the tumor is so large as to be felt by palpation, and on early operation depends the prognosis as to permanent cure. The hematuria is independent of movements, as walking, jolting, horseback riding, etc., and in this respect it differs from the hematuria of renal calculus. In those early cases in which no tumor can be felt however, it will be often impossible to make a differential diagnosis until in the progress of the operation a tumor is found, which extends the operation from an exploratory incision into a nephrectomy.

3. Pain as a symptom is not characteristic of tumors of the kidney, in contradistinction to renal calculus or pyonephrosis.

4. Lumbar exploratory incision for exploration of the other

kidney I consider preferable to abdominal nephrectomy, which has been advocated in cases of this kind. While the latter operation permits satisfactory palpation of the kidney and ureter, I consider lumbar incision as practiced in Case II, less grave, and perfectly sufficient to obtain the necessary information.

5. The prognosis of nephrectomy for malignant tumors is grave. In 1888, Tuffier reported a mortality of 65 per cent. Chevallier collected all the cases to be obtained from the literature a year later, and announced the mortality as 62.5 per cent. Radical cure is very rare. Tuffier, in 1892, stated that the cures on record were only sporadic. Terrillon, Israel, Küster and Sigrist report radical cures.

Tuffier insists that the patient must be well for six years after the operation before a radical cure can be considered certain, as the disease may last for six to ten years. Israel considers three years a sufficient time for radical cure. Czerny lost one patient from relapse two years after nephrectomy. In this case the relapse must have commenced long before that time.

This gloomy outlook is brightened by the recent report from Israel, who has had a quite extensive experience and whose results have been better than those of any previous operator. He reports eleven nephrectomies for malignant tumor, with a mortality of two, or eighteen per cent. Of the nine who recovered, two died from relapses, one after six, the other after thirteen months. Seven are now alive and well. Two of these may be considered as radical cures, as five and one half and four years respectively have elapsed since the operation. This gives a percentage of radical cures of eighteen per cent. The other five have been operated upon too recently to be considered cured. Israel is right in stating that on early diagnosis and early extirpation depend the possibility of radical cure. The earliest diagnosis is that in the renowned case of Israel in which he palpated a carcinoma the size of a cherry, and extirpated the kidney, with radical cure. I do not know of any case in which a relapse has occurred later than the time which has elapsed since the operation in my second case, namely two and one-half years.

2. STONES OF THE KIDNEY.

Stones of the kidney are composed of uric acid, urates, oxalate of lime, phosphates, and of mixtures of these. They may be classified as aseptic and septic stones. Aseptic stones in an aseptic kidney with aseptic urine constitute one class, and septic stones in a suppurating kidney with alkaline urine, the other class. In

the first class the stone is the important, or rather the only feature, while in the second, the stone is secondary in importance to the sepsis or suppuration in the pelvis and the kidney.

Morris, who was the first to operate for stone in an aseptic kidney has termed the operation, nephrolithotomy in contradistinction to nephrotomy by which term he designates the operation on the septic kidney. I consider this a good distinction and think that it will be adopted in the literature, because these two operations are entirely different both clinically and in their results.

a. Nephrolithotomy.

I present here three stones from aseptic kidneys, which are composed of a small nucleus of urates, surrounded by layers of oxalate of lime. Cross sections of these stones are often very beautiful, resembling agate. They are very hard. The surface is usually of a chocolate color, and is covered with little, sharp, projecting points.

CASE I. With presentation of patient. H. J. G., aged twenty-six. He has had severe pain in the left lumbar region for eighteen years, so severe at times that to relieve it he would lower the left shoulder and bend to the left. As a result of this a scoliosis has taken place, with torsion in the lumbar region simulating a tumor. Several years ago he consulted me for pain and occasional hematuria.

Operation: September 16, 1891. No stone could be found on exploration with the needle, but on digital exploration, the stone which I here present, was found in a dilated calyx in the upper third of the kidney. It corresponds in shape to the location in which it was found and presents a groove corresponding to the sharp border of the entrance to the dilated calyx, and which separates an upper portion located in the calyx from a lower portion which extends down into the pelvis.

During the operation the hemorrhage was so serious that I contemplated intravenous injection. Fortunately this procedure was not necessary. The patient made a good recovery and is now entirely well.

CASE II. M. M., aged 34. The patient had suffered from severe pain in the right lumbar region for at least twenty-six years. At times the pain was so excruciating as to make him unfit for work. He also suffered from hematuria and some pus was found in the urine.

Operation August 25, 1892 The pelvis and calices were found to be moderately dilated. The hemorrhage was consider-

able. The large, rugged stone here presented was found in the infundibulum. Four smaller stones composed of oxalate of lime surrounding coagula of blood were found on digital exploration in a dilated calyx having a rather narrow neck, and which was located in the lower third of the kidney. These smaller stones could not have been found by exploration with a steel sound. Careful digital exploration was required to find them. Exploration of the ureter showed that it was not obstructed. The patient had a fistula which closed after four months, and he made a good recovery. The intensity of the pain which this patient suffered may be explained by the sharp points, like pin points, on the surface of the stone.

CASE III. G. N., aged 35. The patient had suffered from pain in the left lumbar region for at least thirty-one years. The pain was so severe as, at times, to disable him for work and to force him to drink large quantities of whisky. Slight hematuria. Dr. Thomas A. Davis, who kindly asked me to operate on this patient, had found blood on several occasions upon microscopical examination of the urine.

Operation, December 3, 1892. A large stone, with a conical lower end, was found in the infundibulum. Little if any dilatation of the pelvis and calices was present. No other stones could be found upon digital exploration. The hemorrhage from the kidney was so alarming as to preclude the possibility of exploring the ureter, and to necessitate packing the pelvis and wound in the kidney with aseptic gauze.

Microscopic examination of the kidney tissue showed that it was almost normal. Only one very small patch of interstitial infiltration around a glomerulus in the midst of healthy kidney tissue was found. The wound closed in four weeks.

b. Nephrotomy.

CASE IV. The patient was a man from 35 to 40 years of age, who suffered from cystitis, pyelitis and pyonephrosis. Upon operation the 144 small, round and flat uric acid and urate stones, often faceted, here presented, were found. The removal of these stones did not help the patient materially. This shows that in such cases the stone is often of secondary importance while the sepsis and inflammation remain.

CASE V. A man from 20 to 30 years old. Upon operation the large phosphatic stone here presented was found, which filled almost the entire pelvis of the kidney. The patient died from

uremia. The autopsy showed that the other kidney contained a stone of equal size.

c. Nephrectomy.

CASE VI. J. D., miner, aged 23, suffered a traumatic rupture of the kidney, caused by a fall of rock, which struck him in the right lumbar region. This injury was followed by a perinephritic abscess which left a fistula.

Operation, February 2, 1892. The kidney was found to be atrophied and suppurating; therefore nephrectomy was performed. In a perinephritic cavity the stone, here presented, was found. It is composed of oxalate of lime around a uric acid nucleus. The broken surface seen in the specimen proves that the stone was crushed at the time of the injury and forced out through the rupture in the kidney. Microscopic examination of the kidney showed diffuse suppurative nephritis. The patient recovered.

REMARKS.—Newman has collected forty-two cases of nephrolithotomy with no deaths; McCosh, eighteen cases with one death; Legueu, forty-three cases with three deaths; Tuffier, forty-three cases with three deaths; this gives a mortality of six per cent. In these operations nephrolithotomy was performed and the kidney incised on the convex border. The result is different when the pelvis contains a stone and the operator does not wish to make an incision in the kidney, and so incises the pelvis. Twelve such cases are on record with a mortality of sixteen per cent as compared with six per cent mortality following incision through the convex border of the kidney.

The material at our disposal is not yet large enough to draw conclusions from, but it would seem better to open on the convex surface of the kidney. Nephrolithotomy with a mortality of six per cent has left only three per cent of fistulas. Pyelotomy, as incision through the pelvis might be called, on the contrary, has a mortality of sixteen per cent and has left twenty-nine per cent of permanent fistulas. This would seem to show that a pelvic wound will not heal so readily as a wound through the kidney.

One hundred and fourteen cases of nephrotomy, or operations on the septic kidney, are reported by Tuffier with a mortality of thirty-three per cent and with permanent fistulas in thirty-four per cent. This high rate of mortality is in the main due to the septic condition of the kidney.

The second alternative in cases of nephrolithiasis is nephrectomy. When the stone is removed by this operation, there is of course no fistula. If the patient survive the operation, he is cured.

Tuffier reports sixty-seven cases of lumbar nephrectomy with a mortality of thirty-nine per cent, and sixteen cases of abdominal nephrectomy with a mortality of thirty-seven per cent.

The statistics of nephrectomy give a mortality of thirty-eight per cent as compared with thirty-three per cent, the mortality from nephrotomy, consequently we must regard nephrotomy as the operation of choice.

In operations on the kidneys the question of hemorrhage is important. In former times I used the Paquelin cautery, but now I use the knife first and tear through afterward, and find that the hemorrhage is no greater than when I used the Paquelin cautery. Hemorrhage may be controlled by packing with iodoform gauze or by suture (Tuffier.) The wound in the aseptic kidney can as a rule be sutured.

In operating for stone in the kidney, the introduction of an exploring needle through the convex surface of the kidney is uncertain and unsatisfactory. The exploration of the kidney with the steel sound is also unsatisfactory, because while one stone may be found, smaller stones may be left in the calices, and these are the more dangerous, because they are about the size to pass into and occlude the ureter. Tuffier reports twenty errors in 114 cases, in nine of which an existing stone was not found, and in eleven a stone was removed, but others were left in the kidney. This incomplete extraction resulted in prolonged drainage and in thirty-four per cent of fistulas which necessitated secondary operation.

Nine of the thirty-eight deaths reported by Tuffier occurred as a result of stone in the other kidney existing at the time of operation.

The only way to avoid leaving stones in the kidney is to make the opening large enough for digital exploration. The kidney should always be incised near the center so that the finger tip can explore the entire kidney. If the entrance to a calyx is not large enough to admit the finger it should be broken through, so that the operator may be sure that no stone has been left. The ureter must also be examined so as to be sure that it is patent from kidney to bladder.

3. SURGERY OF THE URETER.

1. Stones in the Ureter.

CASE I. E. V. C., aged thirty-five. In December, 1890, the patient had the initial attack of renal colic. Six months later came a second attack. The attacks then became more frequent

until he suffered almost constant pain. There was no hematuria. No tumor could be detected, nor could the kidney be made out by palpation. Diagnosis, nephrolithiasis.

Operation: March 27, 1892, nephrolithotomy. The pelvis of the kidney was found to be somewhat dilated, no stone could be found on intrarenal digital exploration. A probe from the wound in the kidney would not pass down the ureter. An examination of the ureter by palpation, after enlarging the lumbar wound, disclosed a stone in the ureter one inch and a half below the infundibulum. A longitudinal incision three-quarters of an inch long was made in the ureter and the stone, which I here present, removed. The groove on the stone was caused by a needle which was pushed into the ureter in the endeavor to dislodge the stone and force it up into the pelvis. A second smaller stone was felt above and removed. A No. 9 French scale flexible bougie could now be passed down into the bladder.

The incision was not united by sutures. On the first day urine passed down into the bladder. After the third day no urine was found in the dressings. The wound or fistula closed in a month.

Tuffier has collected seventeen cases of operation for stone in the ureter, with three deaths and three resultant fistulas. Stones in the upper portion of the ureter have been operated for in nine cases, in four of which the stone was removed by pushing it up into the pelvis, and then incising the pelvis, that is, pyelotomy. One death resulted from nephritis, and the other three patients recovered, two with permanent fistulas. In one case nephrolithotomy was performed, the stone pushed up and removed through the wound in the kidney. This patient recovered. Longitudinal ureterotomy was done in four cases which were all cured, leaving one fistula.

2. *Exploratory Ureterotomy for Stone.*

Exploration of the kidney and ureter by means of ureterotomy, for the purpose of clearing up diagnosis, may be made without detriment to the patient, as will be seen from the following case:

CASE II. Exploratory operation on right kidney and ureter for stone. M. R., aged twenty-eight. Diagnosis: Stone in an aseptic kidney. Operation September 15th, 1892. Lumbar incision. Palpation and examination with needle negative. The kidney was incised by the Paquelin cautery. Profuse hemorrhage followed, and I could not find my way into the pelvis. The pelvis, which was normal in size, was not accessible from below after

lifting up the kidney. The ureter was now incised and a probe passed down into the bladder and up into the pelvis and calices, but no stone could be found. The wound in the ureter was closed by silk sutures passed through the muscular and external coats of the ureter. One drain was passed into the kidney and another down to the wound in the ureter. For two days after the operation no urine escaped into the dressings. For eighteen days thereafter the dressings were saturated with urine. From the fifth to the seventh day, blood was found in the urine. The fistula closed in fifty days.

3. *Stricture of Ureter.*

CASE III. (With presentation of patient.) Valvular stricture or stenosis of pelvic orifice of ureter in a somewhat floating kidney. Mrs. H., twenty-eight years of age, eight years ago had the first attack of intermittent hydronephrosis; the tumor disappeared in two weeks. She had a second attack after child-birth, which lasted eight days. Attacks occurred at intervals of one or two months until two years ago when they became more frequent, occurring every two weeks. During the last year she has had an attack every week. On March 11, 1892, during an attack of pain, a tumor could be felt in the region of the left kidney. Five days later no tumor could be found. During and immediately after the disappearance of the tumors the urine was milky from pus.

Diagnosis: Intermittent pyonephrosis; stenosis in pelvis or ureter, possibly from stone. Advised nephrotomy and exploration of ureter.

Operation May 31, 1892: Nephrotomy in the interval between attacks. I desired to operate during an attack but evacuation took place the night preceding the operation. Before the kidney was reached, the spleen which was somewhat movable, had to be pushed up out of the way. On palpation, no stone could be felt in the kidney or the pelvis, the latter felt like an empty sac. An incision was then made through the convex surface of the kidney. On digital exploration some dilatation of the pelvis and calices was present, but no stone could be found. Catheterization of the ureter was impossible. The pelvis was now opened from its posterior surface. This revealed a valvular opening from the pelvis into the ureter. The valve was divided transversely and the ends of the incision united by a suture. A bougie was inserted through the wound in the kidney and brought down into the ureter, and retained there for two days. The wound in the pelvis was united by sutures. The floating kidney was secured by nephro-

rhapsy, the wound in the kidney drained and the usual dressings applied. The patient recovered without fistula, and up to the present time has had no return of the pyonephrosis.

CASE IV. Traumatic stricture of ureter close to its entrance into the pelvis of the kidney. Intermittent hydronephrosis. The patient was a man forty-seven years of age. Thirty-four years ago in jumping from a horse to the ground, on account of miscalculation of distance, he sustained an injury by a violent jerk, his feet not touching the ground while his hands still retained hold of the hames. He was in bed a month at this time, and after ten years the hydronephrosis developed which eventually compelled him to come under my care. A year after the first attack, he had four or five attacks a year, lasting two or three days and then subsiding rapidly, being followed by pus in the urine. I examined the patient on November 12, 1892 and found a tumor in the left kidney, and made a diagnosis of nephrolithiasis in the pelvis or infundibulum, or pyonephrosis from stone or obstruction in the ureter.

Operation: November 26, 1892. No tumor could at this time be felt. I made a lumbar nephrotomy, and found the kidney sacculated, but could find no stone in the pelvis or calices. The ureteral entrance could not be found through the wound in the kidney. The dilated pelvis was now incised on its posterior wall, but still the opening of the ureter could neither be seen nor felt. The ureter was now isolated. Its upper end for half an inch was found to be imbedded in cicatricial tissue. Lower down, though small in caliber the ureter was normal. A longitudinal incision one centimeter long was now made in the ureter just below the cicatrix. The sound could now be passed easily down into the bladder, but when passed upward its progress was stopped by a stricture situated immediately below the pelvis. The stricture was one centimeter long and the ureter below it was somewhat narrowed, not in one place, but diffusely throughout its extent. The stricture was then incised up into the pelvis. A plastic operation was now made similar to that of Heinecke-Mikulicz for stenosis of the pylorus; that is, the ureter was united to the pelvis on that principle. The pelvic wound was united by sutures. No bougie was left in the ureter. A drainage tube was passed into the pelvis through the wound in the kidney. The usual external drainage was employed and the wound united. The patient left the hospital in six weeks with the wound perfectly healed. The urine at this time contained no pus visible to the naked eye. On microscopical examination, a few isolated pus cells could be found in the sediment.

REMARKS.—In all cases of pyonephrosis we may expect to find some obstruction to the flow of urine either in the renal pelvis, the ureter, the bladder or the urethra. If the obstruction is external to the ureteral opening in the bladder, the pyonephrosis is double; if on one side, the obstruction must be in the ureter or the pelvis of the kidney.

Lumbar nephrotomy for pyonephrosis has a mortality of 23.3 per cent, and primary lumbar nephrectomy a mortality of 34 per cent. (Tuffier.) Secondary nephrectomy must be made to close the fistula after some time has passed, but this should not be delayed until amyloid nephritis of the other kidney has set in. The mortality from this operation is low, 5.9 per cent. If we add the 5.9 per cent mortality from secondary nephrectomy to the 23.3 per cent mortality from primary nephrotomy, the total of 29.2 per cent is still 7.8 per cent less than the mortality from primary nephrectomy, which is 37 per cent, and 4.8 per cent less than the mortality from primary lumbar nephrectomy, which is 34 per cent. Consequently, in pyonephrosis, nephrotomy is the operation of choice (Tuffier).

The disadvantage of nephrotomy as compared with nephrectomy for pyonephrosis is that a fistula remains in 45 per cent of the cases. This means that after a time a secondary nephrectomy must be made. Fistulas remained in 34 per cent of the cases of calculous pyelitis and in 54 per cent of the cases of non-calculous pyelitis. The smaller number of fistulas in calculous pyelitis is to be accounted for by the fact that in a certain number of these cases the stone, prevents the passage of urine, and with the removal of the stone the obstruction is removed. Where there is no stone, simple nephrotomy will leave the impediment in all cases. If in both calculous and non-calculous pyonephrosis we can reëstablish the permeability of the ureter, we may expect to materially diminish the percentage of permanent fistula.

Tuffier, in the discussion of pyonephrosis, in his excellent monograph on surgery of the urinary organs which appeared in Volume VII of Duplay and Reclus', *Traité de Chirurgie* in May, 1892, remarks: "It would be interesting to know the condition of the ureter, the strictures, bands, valve-formations that transform an open pyelonephritis into a temporarily closed hydro- or pyonephrosis. As yet these investigations for the intermittent pyonephrosis have not been made."

THE OPERATION FOR PYONEPHROSIS.

The operation for pyonephrosis should be nephrotomy, followed by exploration of the ureter from the kidney or pelvis to the bladder, and, if necessary, by a plastic operation for valves or stricture in the ureter.

A differential diagnosis is impossible before the kidney is incised. It is often impossible to determine beforehand whether a stone is or is not present; the number of stones; whether the stones are located in calices, the pelvis or ureter, or whether or not the obstruction is caused by a valve, band or stricture of the ureter. It is also impossible to know beforehand the condition of the kidney tissue, whether it is totally destroyed, filled with multiple abscesses, or if a greater or less amount of functionally valuable tissue is present.

The operation for pyonephrosis must in a great number of the cases be exploratory, and the urinary passages should be thoroughly explored for stones, tumors, tuberculosis, stenosis, etc., from the kidney to the bladder. That this exploration can be done successfully in case of valve-formation at the pelvic orifice of the ureter or in case of stricture near this region, has been shown in the case reports above given.

I propose the following plan of operation, which I have followed out in a number of cases:

1. Lumbar incision, oblique, from the corner of the twelfth rib and erector spinae muscle, downward and forward toward the ilium.
2. Palpation of the kidney after detachment of the adipose capsule, and palpation of the pelvis.
3. Exploration of kidney by needle to detect stone is unreliable.
4. Excision of a piece of kidney tissue for microscopical examination.
5. The incision should be longitudinal, on convex border of kidney, and one and a half to two inches in length, and may be made by the Paquelin cautery or the knife. If possible I make the incision guided by an aspirator needle which has been introduced into the dilated pelvis to explore for pus. Without such a guide it may be very difficult to find the way into the non-dilated pelvis, as was shown in Case II, exploratory ureterotomy.
6. Exploration through the renal wound by a curved steel urethral sound, to detect stones in the pelvis and calices, is also unreliable. In 9 cases an existing stone was not found, and in 11

cases one or more stones were extracted, but stones still left in the kidney, that is, incomplete extraction. This resulted in 34 per cent of permanent fistulas which required later another operation for their closure.

7. Digital exploration of the pelvis and calices I consider the most satisfactory method, and the one that will best secure against incomplete extraction of stones. A narrow entrance to a dilated calyx can be dilated or ruptured by the finger.

8. Exploration of the ureter as to its permeability should be done from the renal wound by a long flexible silver probe (a uterine probe) or an elastic bougie, either olive pointed or not. If the bougie passes into the bladder, the examination is at an end.

9. The size of bougie that will pass through a healthy ureter is from 9 to 12, French scale.

10. If the pelvic orifice of the ureter cannot be found from the renal wound, it should be sought for by opening the pelvis, pyelotomy, or by incising the ureter, ureterotomy.

11. Pyelotomy. A longitudinal incision, half an inch to an inch long, in the posterior wall of the pelvis can be made while the kidney is lifted upward against the twelfth rib. This procedure is easy if the pelvis is dilated, but may be impossible if the pelvis is of normal size.

a. Extraction of a stone in the infundibulum through an incision in the pelvis is advised against by Tuffier on the ground that pyelotomy increases the danger of the operation, and that union of the wound in the pelvis is difficult. My experience in this regard is not in accord with Tuffier's statement.

b. The pelvic wound should be united by extra-mucous sutures.

12. Ureterotomy. A longitudinal incision from half a centimeter to two centimeters in length is sufficient for the extraction of a stone which cannot be dislodged upward into the pelvis, and for exploration of the ureter if the pelvis is not dilated, and consequently not easily accessible.

The wound in the ureter may be closed with extra-mucous sutures, or may be left open. In either case the wound will close without causing stenosis of the canal. A ureteral fistula is not to be expected if the ureter is open between the wound and the bladder.

13. A valve, or valvular stricture at the pelvic orifice of the ureter is usually caused by lateral insertion of the ureter in a dilated pelvis. A plastic operation upon the valve, in order to secure

free passage of urine from the pelvis into the bladder, can be performed through the incision in the pelvis as shown in Case III.

Küster performed a similar operation on a valve, but finding a stricture lower down in the ureter he proceeded to resect the upper strictured portion of the ureter, and united the cut end of the ureter below the stricture with the pelvis.

14. A stricture in the ureter, if not too long, can be treated by a plastic operation on the plan of the Heinecke-Mikulicz operation for stenosis of the pylorus, longitudinal division of the stricture and transverse union of the longitudinal wound.

This method of operating for ureteral stricture seems to me preferable to resection of the strictured part of the ureter (Küster's operation) for the following reasons:

a. It is a more economical operation and preferable when the elongation of the ureter is not sufficient to permit the two cut ends of the ureter, after excision of the stricture, to come in contact without stretching.

b. It is easier to secure union of a ureter which has been incompletely divided in a transverse direction. Tuffier's experiments on dogs gave the following results: Six cases of transverse ureterotomy all failed; four cases of longitudinal ureterotomy were followed by a successful result in two cases.

15. Resection of the upper end of the ureter and implantation of the distal end into the pelvis has been performed in an important and interesting case by Küster, and the result was a brilliant success. His method was to split and unfold the end of the ureter, and to implant it into the opened pelvis, to which it was united with sutures.

In a similar case of stricture in the upper end of the ureter, especially if the ureter were not elongated or the kidney movable, I should prefer the plastic operation already described, as it is easier of technique, and as it proved successful in my case of traumatic stricture in the ureter below the pelvic orifice.

16. The ureter is accessible through an extra-peritoneal incision, a continuation of the oblique incision for lumbar nephrotomy, from the twelfth rib down along and one inch anterior to the ilium and along Poupart's ligament to about its middle. This incision as shown in the drawing made by me from investigations on the cadaver, gives access to the upper three-fourths of the ureter and down to within an inch and a half or two inches above the bladder.

The vesical and lower pelvic portions of the ureter may be reached, as Cabot of Boston has pointed out, by means of the sacral operation, or Kraske's method modified by osteoplastic, temporary resection of the os sacrum. In woman, the vesical portion of the urethra is accessible through the vagina.

The vesical orifice of the ureter may be reached from within the bladder by supra-pubic cystotomy in man or by dilatation of the urethra, or supra-pubic or vaginal cystotomy in woman.

In conclusion, I wish to cite literally the remarks made by Küster at the conclusion of his communication to the German Surgical Congress, because I fully agree with Küster and think that his remarks apply well to my proposals of this evening. Küster says:—

“Gentlemen: When I bring this case before you, it is not to present to you a curious operation or a curiosity in the line of operating. The value of the observation appears to me to lie in the fact that it shows a method by which it may be possible to avoid the mutilating and dangerous operation of nephrectomy in cases of pyonephrosis where and when we do not know that the other kidney is perfectly healthy.”

I would add—and a means to save or avoid some instances of permanent fistulas following nephrotomy for pyo- or hydro-nephrosis.

NOTE.—When I commenced to investigate the question of stenosis of the ureter and its possible operative treatment, I did not know that Küster had commenced work in the same direction. The first publication of Küster's case which reached me, was his report before the Twenty-first German Surgical Congress, June 8 to 11, 1892, which appeared in the *Centralblatt für die Gesammte Medicin* for August 13, 1892.

My first operation for stenosis was performed at a clinic and described in a clinical lecture given on May 31, 1892, at the Emergency Hospital, Chicago, for the Chicago Polyclinic.

